KAPOHO TIDE POOL SURVEY 1992

PROJECT MEMBERS

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I. ABSTRACT

The 1992 Kapoho Tide Pool Survey covered three major animal populations: coral, fish, and macroscopic daytime invertebrates. Percent coral cover was calculated using the Brock Transect Method and determined rock and rubble the to be most abundant, 42.575%, followed by Porites lobata, Pavona varians, Montipora capitata, Porites compressa, and Pocillopora meandrina, respectively.

The family Labridae was the most prominent family in this year's census holding approximately 1/3 of all the different species recorded. Thalassoma duperrey was the single most abundant species at an average of 19.16% of the total number of individuals counted. This is comparible to last year's population percentage which was 19.2%.

Macroscopic daytime invertebrates contained the largest percentage within the Phylum Echinodermata, representing 86.4%. The Phylum Annelida was also represented in the survey at 13.6% of the population of invertebrates counted.

Water temperature generally remained constant for both transects between 25.0 c and 27.1 c, with the exception of the results from July 9 which were unusually low, 23.9 c and 24.0 c.

The salinity was consistant throughout the study, between 28.9 and 30.0.

II. INTRODUCTION

The study of the Kapoho, Hawaii shoreline began two decades ago by John I. Ford. Initially the study was centered on pollution input from homes built along the shoreline and how it affected the intertidal zone. In 1990, the survey was continued by a group of University of Hawaii-Hilo students. They altered the study somewhat by focusing more on biological and physical characteristics rather than on pollution effects. Since then, permanent transect line locations have been placed within the tidal area to serve as an outdoor laboratory where long-term changes can be monitored. This year the study to help monitor the ever-changing characteristics and health of the Kapoho reef will continue and hopefully prove itself to be useful information to future surveyors of the project.

III. METHODS

Since this study has been newly designed to accommodate long-term monitoring, three permanent transect locations were installed in the summer of 1991 and provided a consistent working area to record changes from year to year (see Figure 1). Transect lines made of Kevlar were used because it sinks easily and has < 1% stretch underwater as compared to nylon rope which has nearly 10% stretch under strain (Hallacher 1992). Out of the three ten meter straight transect lines, only two were used to compile information for this year's continuation. This is mainly due to the lack of time and manpower.

1. Animal Populations

The emphasis of our research centered on percentage of coral cover along transect lines one and two. A 1\4 square meter quadrat made of hollow plastic tubing was placed at one meter intervals along both sides of the transect lines. The quadrats were subdivided into equal 1\16 blocks by fishing line which was strung through the pipe. At each meter mark, the lower left-hand corner of the quadrat was matched up and placed parallel to the line upon the area to be surveyed (see Figure 2). The percent cover of the existing coral was recorded onto waterproof slates of sanded opaque plexiglass and later transcribed into workable graph data as shown throughout this report. This data was recorded during the second and third weeks of the study period.

Our next center of study was fish censusing. The Brock

Transect Method was used to continue the monitoring of any temporal variations in the designated locations. This was accomplished by using two surveyors, one on each side of the transect line. After a five minute "equilibrium" period which allowed the fish to resume their normal behavior, the swimmers slowly advanced along the line recording the species present and their abundances within five meters on each side of the line. A U-turn was made at the end of the line and the process was repeated. The data of each swimmer was termed "Run 1" and "Run 2" even though they were completed at the same time. Results are discussed in Section IV of this report (see Figure 3).

The final animal population estimate was completed on macroscopic daytime invertebrates. The same method of censusing was used here, as with the fish, with the exception that only one pass was made by the surveyors instead of two. This is because the invertebrates are basically non-motile and easy to locate.

Due to lack of time and manpower, plankton densities were not calculated.

2. Water Samples

Water samples were taken on the dates of June 25, July 3, 9, and 16, 1992 between 14:40 and 15:20. The samples were taken to determine salinity at the predetermined transect sites with eight 250 mL plastic sampling bottles at the surface and at the bottom of both ends of each transect. Generally the bottles were left alone overnight in the laboratory and salinities recorded the next day. The YSI model salinometer was used for attaining the data.

Water temperatures were also recorded at the surface and bottom of both ends of the lines using a thermometer that measured in celsius degrees within plus or minus one degree.

Kapoho Tide Pools
Fixed Transect Line Location

MOP June 1991

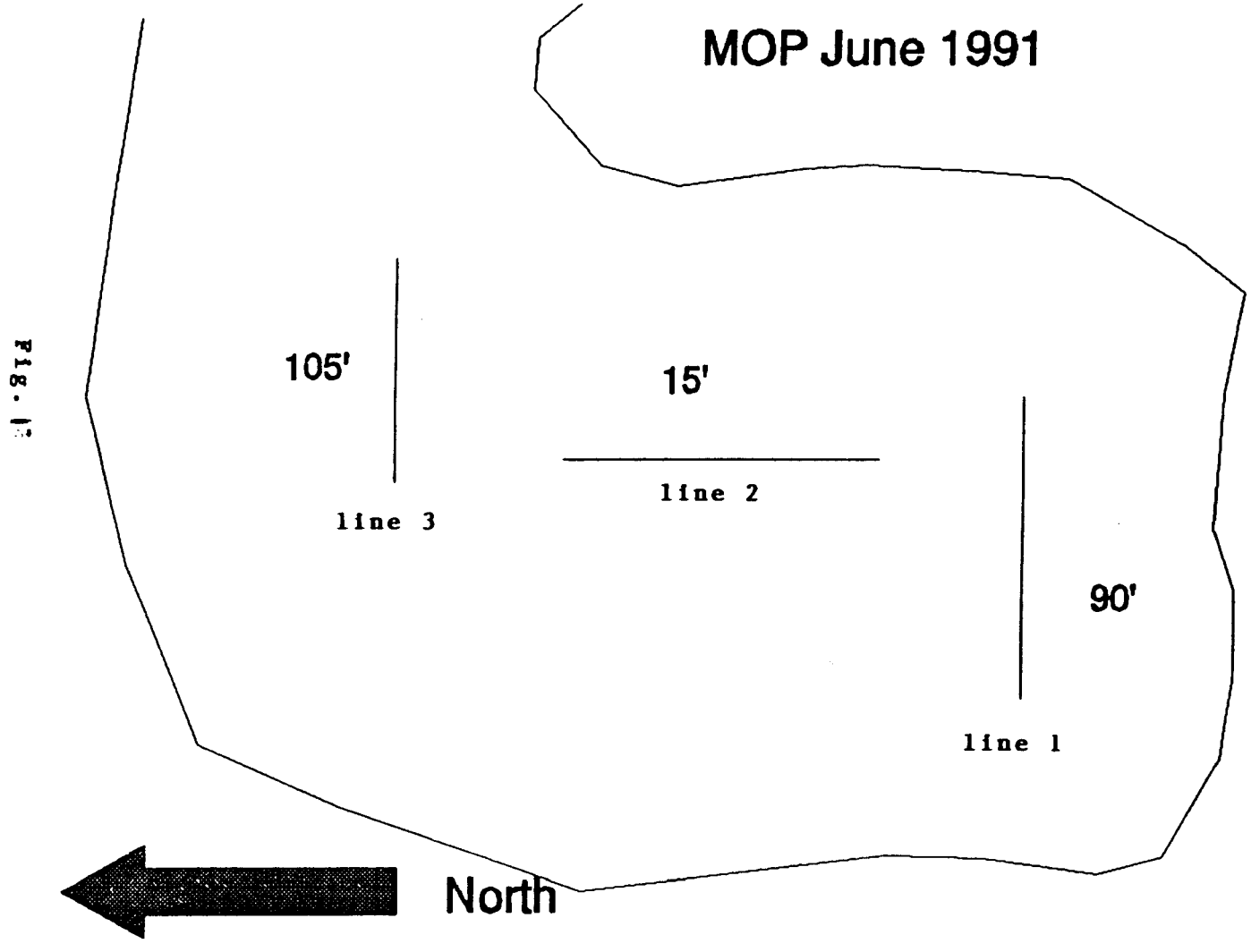
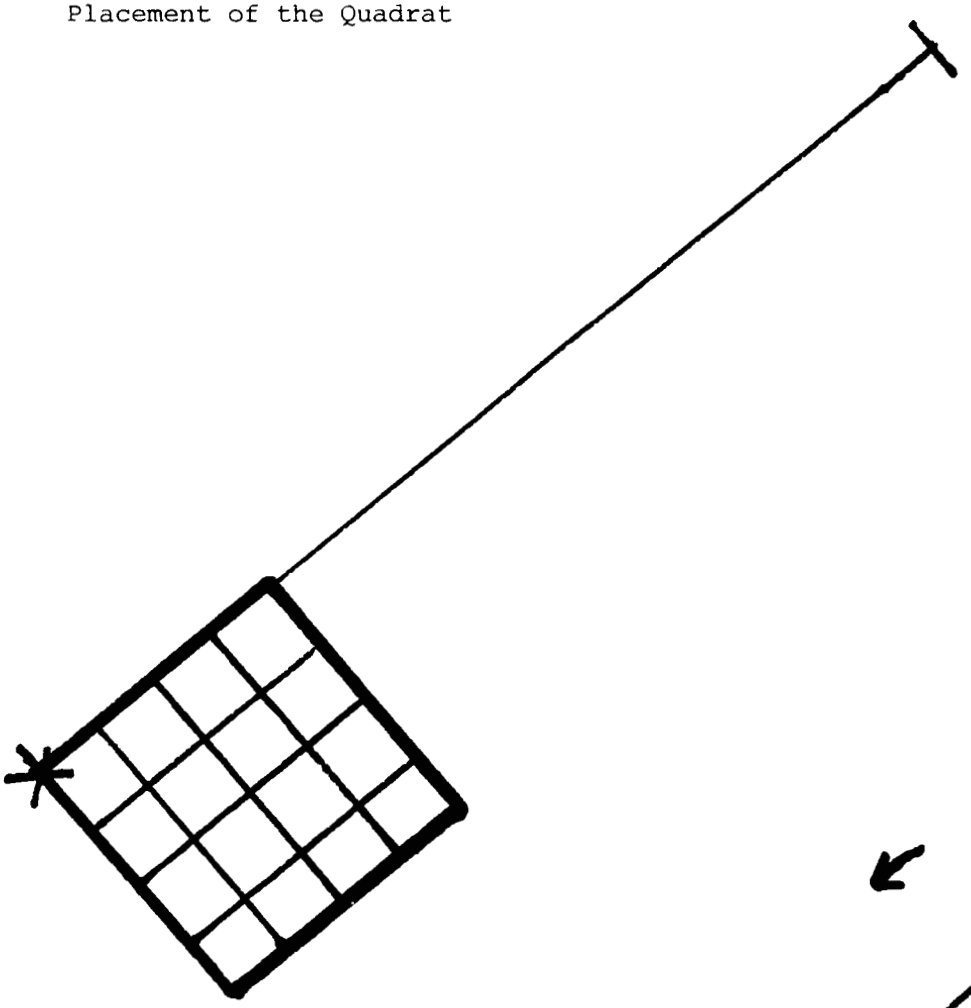


FIGURE 2 Placement of the Quadrat



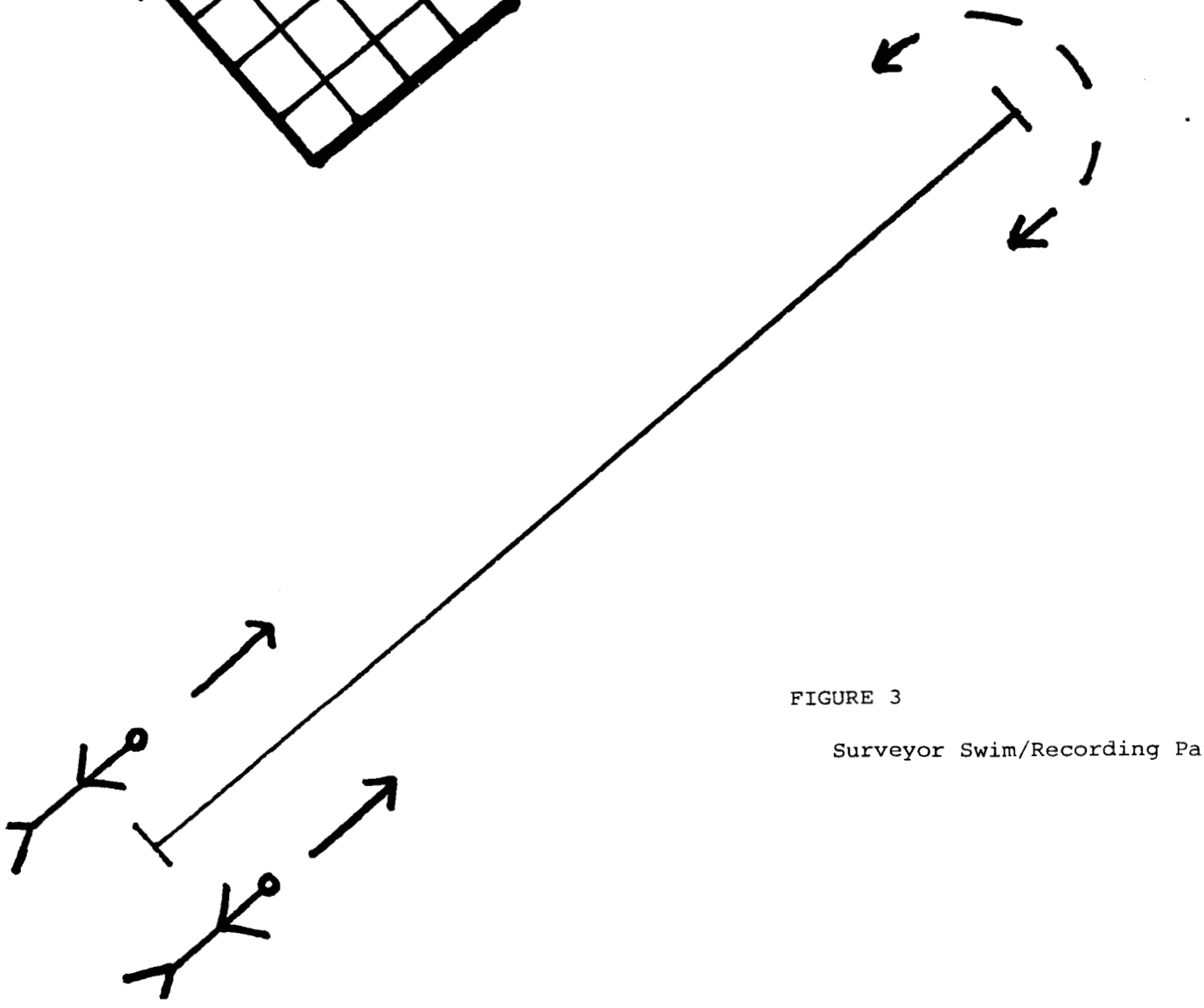


FIGURE 3

Surveyor Swim/Recording Pattern

IV. RESULTS

1. Coral Coverage

The species observed along the transect lines were Porites lobata, Pavona varians, Montipora capitata, Porites compressa, Pocillopora meandrina, and rock and rubble.

Results along transect one contained high percentages of rock/rubble at 31.5% and Pavona varians at 29.5%. The rest were recorded as follows: Porites lobata, 21.0%, Montipora capitata, 15.95%, Porites compressa, 0.30%, and Pocillopora meandrina, 0.0% (see Table 1).

Transect two contained a high percentage of rock/rubble, more than half of the sampling, with 53.6%. The remaining species, in decreasing abundance, are as follows: Porites lobata, 25.7%, Montipora capitata, 13.75%, Pavona varians, 3.40%, Pocillopora meandrina, 3.40%, and Porites compressa, 0.15% (see Table 2).

Overall coral cover percentages for both transects are: rock/rubble, 42.575%, Porites lobata, 23.3%, Pavona varians, 16.475%, Montipora capitata, 14.85%, Porites compressa, 0.225%, and Pocillopora meandrina, 1.7% (see Table 3).

2. Fish Census

After the fish censusing was finished, the data was combined to show the following figures:

There were eight families represented along transect

one, with twenty-one different species spread among them. The family showing the most diversity here was Labridae, with seven species, or 33.33% representation of all species combined. Even though the family Labridae contained the most diversity, the species most abundant along the transect was Mulloides flavolineatus at 26.05% of the total individuals counted.

On transect two, twelve species were representative of eight families. Here too, the family Labridae had the most diversity with four species represented, or 33.33% of total number of species. The most abundant species seen along the line was Thallosoma duperrey, comprising 48.9% of the total individuals seen.

For individual family and species percentages see Tables 4-8.

Overall, nine families were represented between the two transects. There were twenty-two species of fish recorded. Thalassoma duperrey was the most abundant species counted at a total average of 32.0 fish , or 19.16% total. Labridae was the most prominent family, with seven of it's species represented, or 31.8% of the total number of species.

3. Daytime Invertebrates

The macroscopic daytime invertebrates observed along the transect lines were: Echinometra mathaei, Echinometra oblonga, Hetrocentrotus mammillatus, Spirobranchus giganteus, and Actinopyga mauritiana. Transect one contained 52.4% Echinometra mathaei, 0.0% Echinometra oblonga, 6.0% Hetrocentrotus

mammillatus, 30.9% Spirobranchus gigantus, and 10.7% Actinopyga mauritiana. Transect two contained 90.1% E. mathaei, 0.66% E. oblonga, 3.3% H. mammillatus, 3.95% S. giganteus, and 2.0% A. mauritiana (see Table 9).

Combining transects one and two, the overall percentages for individual phyla are as follows:

Phylum Echinodermata, consisting of E. mathaei, E. oblonga, H. mammillatus, and A mauritiana, totalled 86.4%.

Phylum Annelida consisting of S. giganteus totalled 13.6% (see Table 10).

4. Water Sampling

For water salinity and temperature data at times of surveillance, see Table 11.

% CORAL COVER TRANSECT ONE

Quadrat #	Montipora capitata	Porites lobata	Pavona varians	Porites compressa	Pocillopora meandrina	Rock/ Rubble
1	52	12	25	0	0	11
2	24	37	0	0	0	39
3	14	6	27	0	0	47
4	21	9	67	0	0	2
5	12	17	0	0	0	71
6	0	40	48	0	0	12
7	0	0	100	0	0	0
8	6	6	78	0	0	10
9	39	0	58	0	0	3
10	24	0	0	0	0	76
11	0	0	0	6	0	94
12	9	0	0	0	0	91
13	42	22	15	0	0	21
14	0	15	14	0	0	45
15	0	23	44	0	0	33
16	30	70	0	0	0	0
17	0	35	25	0	0	40
18	0	15	85	0	0	0
19	40	50	5	0	0	5
20	6	63	0	0	0	31
Totals	319	420	591	6	0	631
Average %	15.950	21.000	29.550	0.300	0.000	31.550

TABLE 1

% CORAL COVER TRANSECT TWO

Quadrat #	*Montipora capitata*	*Porites lobata*	*Pavona varians*	*Porites compressa*	*Pocillopora meandrina*	*Rock/ Rubble*
1	0	10	0	0	0	90
2	0	0	2	0	0	98
3	20	75	0	0	0	5
4	100	0	0	0	0	0
5	0	19	0	0	0	81
6	0	44	0	0	0	56
7	0	12	0	0	15	73
8	0	37	0	0	0	63
9	9	0	0	0	0	91
10	0	0	4	0	0	96
11	65	0	0	0	0	35
12	0	4	0	0	0	96
13	0	92	0	0	0	8
14	0	2	5	3	0	90
15	0	72	0	0	0	28
16	0	13	20	0	8	59
17	25	8	0	0	45	22
18	56	43	0	0	0	1
19	0	83	0	0	0	17
20	0	0	37	0	0	63
Totals	275	514	68	3	68	1072
Average %	13.75	25.7	3.4	0.15	3.4	53.6

TABLE 2

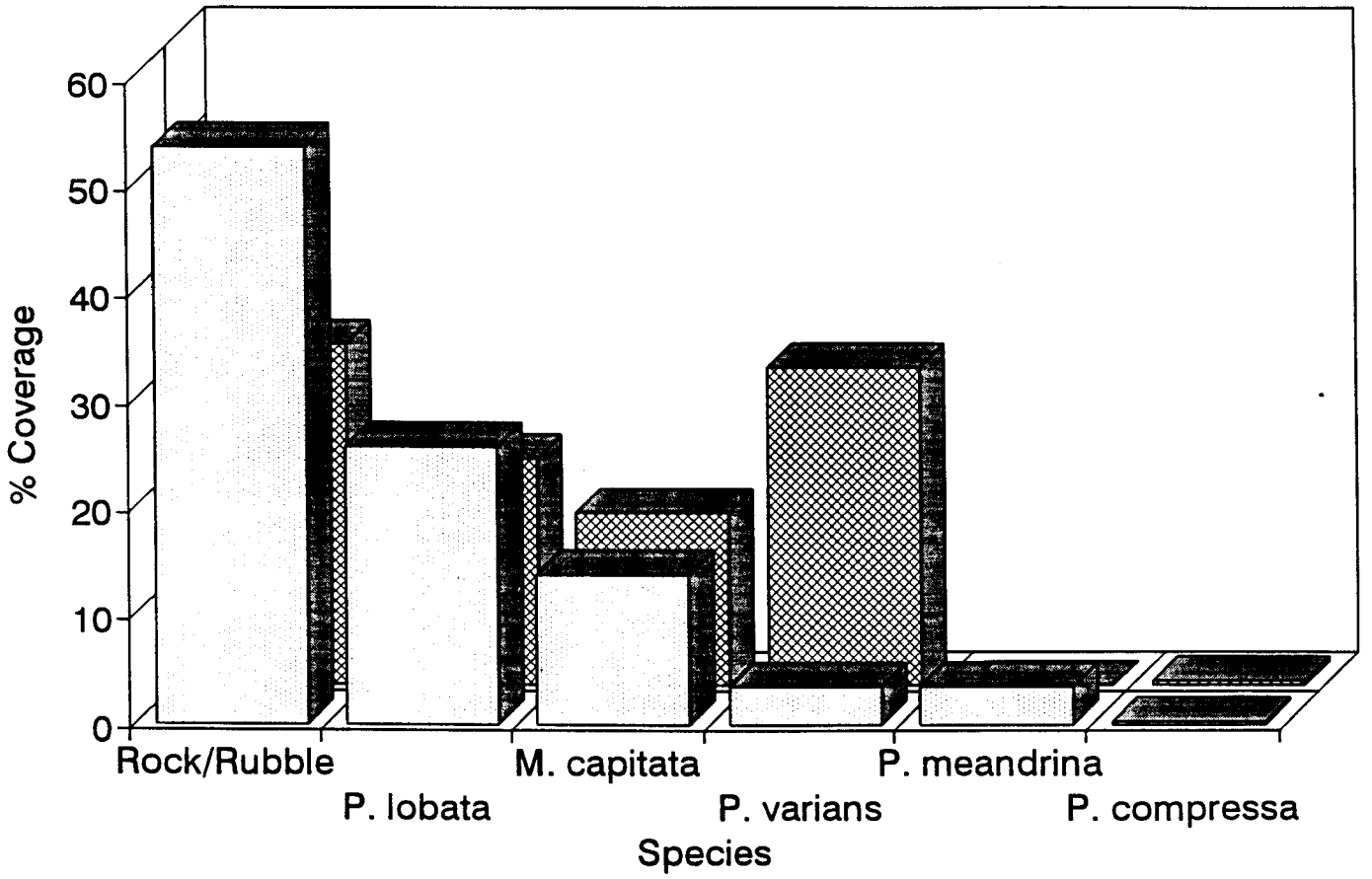
COMBINED CORAL COVER % TRANSECTS ONE AND TWO

SPECIES	Transect 1 %	Transect 2 %	Combined Avg
Montipora capitata	15.95	13.75	14.85
Porites lobata	21	25.7	23.35
Pavona varians	29.55	3.4	16.475
Porites compressa	0.3	0.15	0.225
Pocillopora meandrina	0	3.4	1.7
Rock/Rubble	31.55	53.6	42.575

TABLE 3

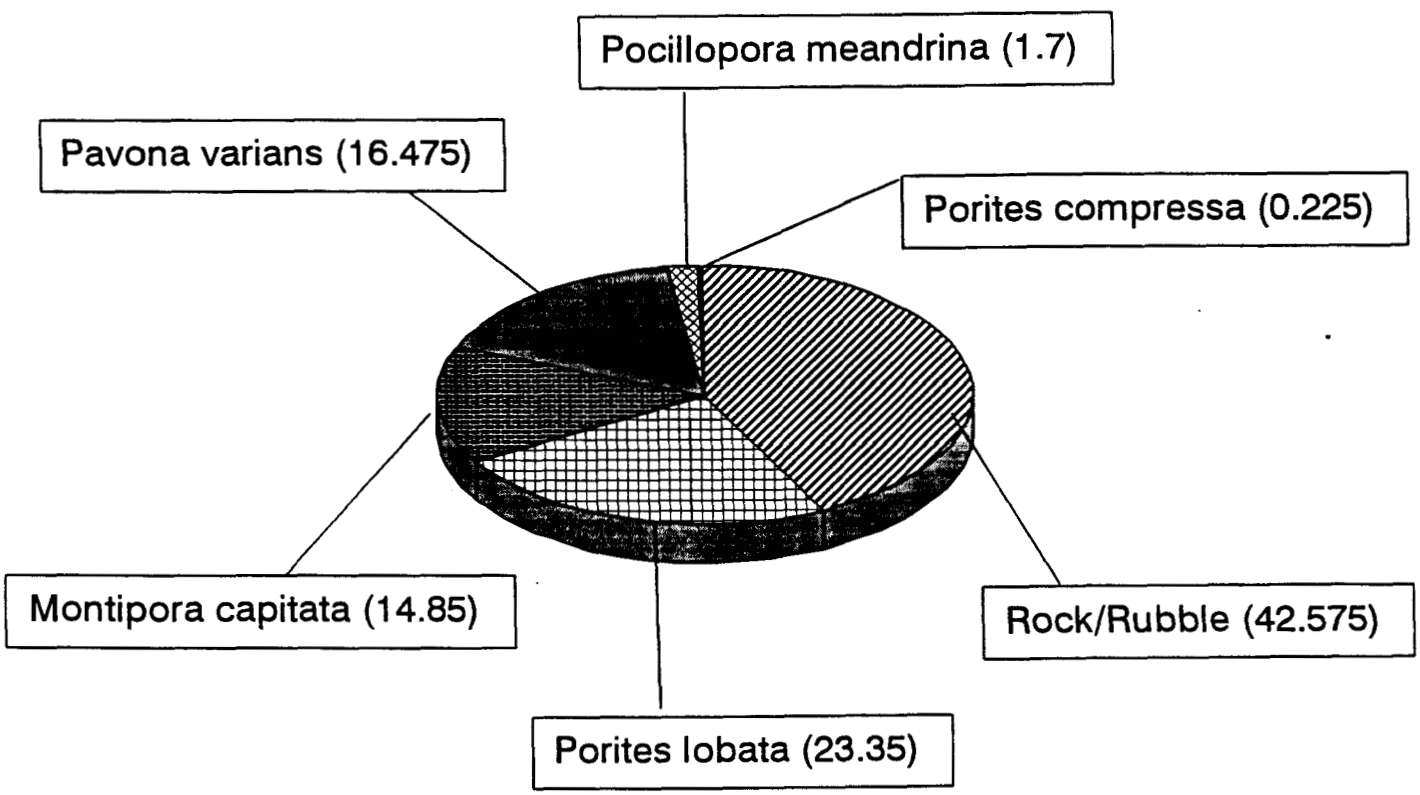
Kapoho Tide Pool Survey 1992

% Coral Coverage - Transects 1 & 2



Kapoho Tide Pool Survey 1992

Precent Combined Coral Coverage



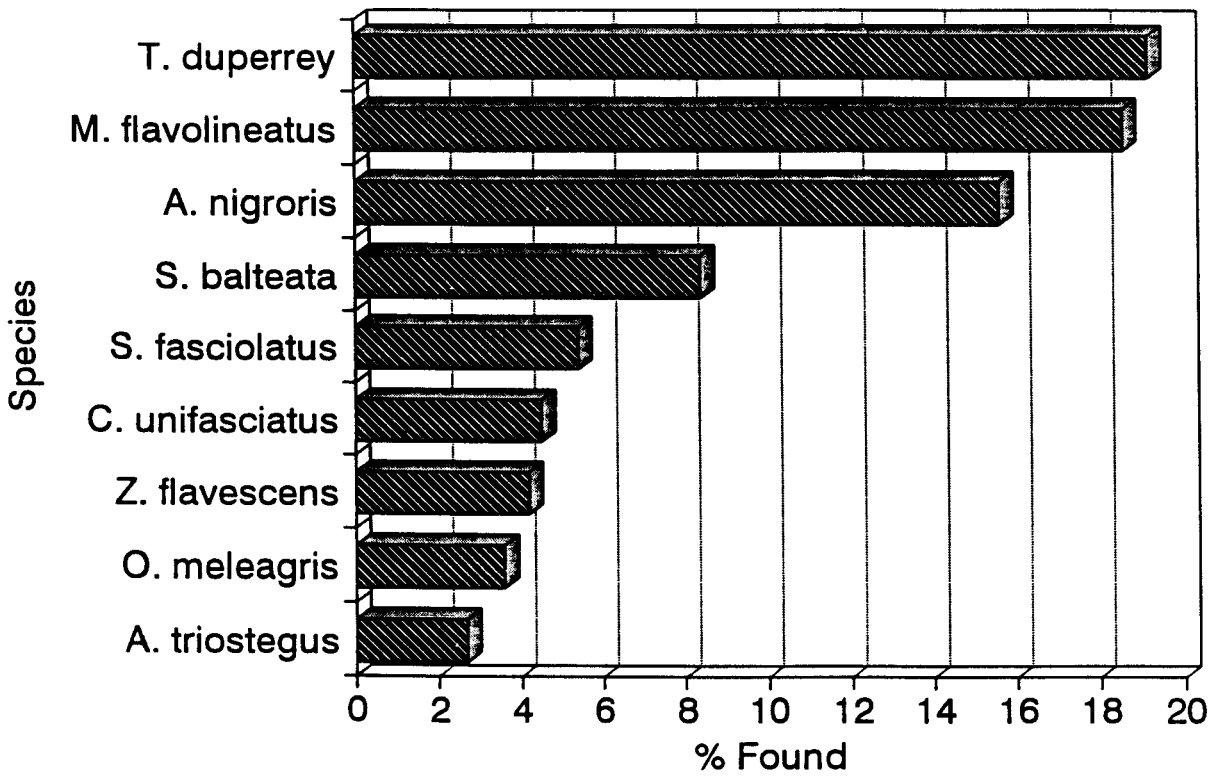
TRANSECT 1 FISH CENSUS

FAMILY	SPECIES	RUN 1	RUN 2	TOTAL #	AVERAGE # R1 + R2	% AVE. GRAND TOT.
Mullidae	Mulloides flavolineatus	29	33	62	31	26.05042017
	Parupeneus multifasciatus	1	4	5	2.5	2.100840336
Synodontidae	Synodus binotatus	0	1	1	0.5	0.420168067
Chaeodontidae	Chaetodon lunula	1	1	2	1	0.840336134
Pomacentridae	Plectroglyphidodon impar.	2	1	3	1.5	1.260504202
	P. johnstonianus	1	3	4	2	1.680672269
	Stegastes fasciolatus	0	2	2	1	0.84034
Labridae	Cheilinus unifasciatus	6	9	15	7.5	6.302521008
	Coris flavovittata	0	5	5	2.5	2.10084
	Gomphosus varius	2	0	2	1	0.84034
	Labroides phthirophagus	2	3	5	2.5	2.10084
	Pseudocheilinus octotaenia	0	2	2	1	0.84034
	Thalassoma duperrey	2	15	17	8.5	7.142857143
	Stethojulis balteata	15	13	28	14	11.76470588
Acanthuridae	Acanthurus leuocopareius	2	0	2	1	0.84034
	A. nigroris	20	27	47	23.5	19.74789916
	A. triostegus	6	3	9	4.5	3.781512605
	Ctenochaetus strigosus	4	1	5	2.5	2.10084
	Zebrasoma flavescens	7	7	14	7	5.882352941
Ostraciontidae	Ostracion meleagris	2	3	5	2.5	2.10084
Tetraodontidae	Cathigaster jactator	3	0	3	1.5	1.260504202
	Number of Individuals	105	133	238		
			Avg. Grand Total		119	

TABLE 4

Kapoho Tide Pool Survey 1992

Top Ten Fish



COMBINED TOTALS OF TRANSECTS 1 AND 2 FISH CENSUS

FAMILY	SPECIES	T-1 AVG NO. INDIVIDUALS	T-2 AVG. NO. INDIVUALS	TOTAL NO. INDIV.
Mullidae	Mulloides flavolineatus	31	0	31
	Parupeneus multifasciatus	2.5	1	3.5
Synodontidae	Synodus binotatus	0.5	0	0.5
Chaetodontidae	Chaetodon lunula	1	1	2
Pomacentridae	Plectroglyphidodon impar.	1.5	2	3.5
	P. johnstonianus	2	0	2
	Stegastes fasciolatus	1	8	9
Labridae	Cheilinus unifasciolatus	7.5	0	7.5
	Coris flavovittata	2.5	0.5	3
	Gomphosus varius	1	0.5	1.5
	Labroides phthirophagus	2.5	1	3.5
	Pseudocheilinus octotaenia	1	0	1
	Thalassoma duperrey	8.5	23.5	32
	Stethojulis balteata	14	0	14
Acanthuridae	Acanthurus leucoparius	1	0	1
	A. nigroris	23.5	2.5	26
	A. triostegus	4.5	0	4.5
	Ctenochaetus strigosus	2.5	0	2.5
	Zebrasoma flavescens	7	0	7
Ostracionidae	Ostracion meleagris	2.5	3.5	6
Tetraodontidae	Canthigaster jactator	1.5	2	3
Sygnathidae	Doryhamphus excisus	0	2.5	
	Number of Individuals	119	48	

TABLE 6

REPRESENTATION OF FISH CENSUS ON TRANSECT 1 BY FAMILIES

FAMILY	NO. SPP. REPRESENTED	% REPRESENTATION
Labridae	7	33.33
Acanthuridae	5	23.8
Pomacentridae	3	14.3
Mullidae	2	9.5
Chaetodontidae	1	4.8
Ostraciontidae	1	4.8
Syndodontidae	1	4.8
Tetraodontidae	1	4.8
TOTALS	21	

TABLE 7

REPRESENTATION OF FISH CENSUS ON TRANSECT 2 BY FAMILIES

FAMILY	NO. SPP. REPRESENTED	% REPRESENTATION
Labridae	4	33.33
Pomacentridae	2	16.7
Acanthuridae	1	8.33
Chaetodontidae	1	8.33
Mullidae	1	8.33
Ostraciontidae	1	8.33
Sygnathidae	1	8.33
Tetraodontidae	1	8.33
TOTALS	12	

TABLE 8

INVERTEBRATE CENSUS TOTALS FOR TRANSECTS 1 AND 2

PHYLUM	SPECIES	NO. INDIV. T-1	NO. INDIV. T-2	TOTAL # INDIV.	% INDIV. T-1	% INDIV. T-2	TOTAL % T-1 and T-2
Echinodermata	Echinometra mathaei	44	137	181	52.4	90.1	76.7
	Echinometra oblonga	0	1	1	0	0.66	0.42
	Heterocentrotus mammillatus	5	5	10	6	3.3	4.2
	Actinopyga mauritiana	9	3	12	10.7	2	5.1
Annelida	Spirobranchus giganteus	26	6	32	30.9	3.95	13.6
	TOTALS	84	152	236			

TABLE 9

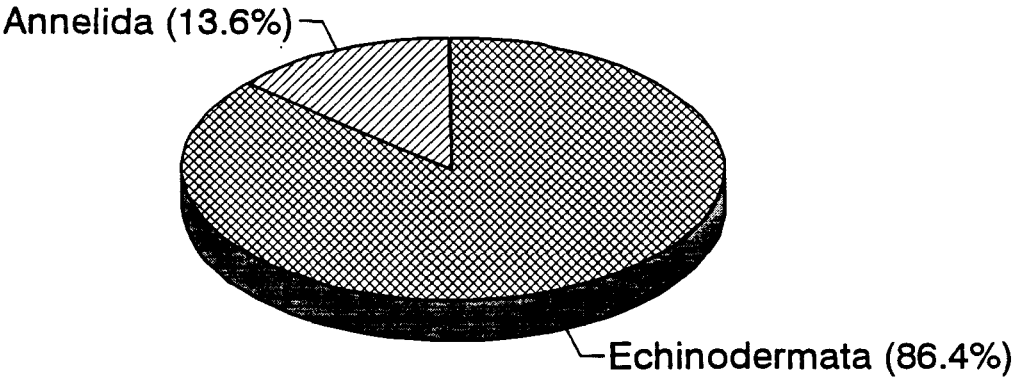
REPRESENTATION OF DAYTIME INVERTEBRATE CENSUS BY PHYLUM

PHYLUM	NO. INDIVIDUALS	% TOTAL
Echinodermata	204	86.4
Annelida	32	13.6
TOTALS	236	

TABLE 10

Kapoho Tide Pool Survey 1992

% Daytime Invertebrates by Phylum



1992 Kapoho Tide Pool Survey
Temperature and Salinity

Date: June 25, 1992
Location: Transect 1
Time: 15:00

Reference	Temperature	Salinity	Depth
surface, 0m	26.7c	28.9	surface
bottom, 0m	26.1c	29.4	n\a
surface, 10m	27.1c	29.1	surface
bottom, 10m	26.0c	29.3	n\a

Location: Transect 2
Time: 15:15

Reference	Temperature	Salinity	Depth
surface, 0m	27.0c	29.4	surface
bottom, 0m	26.9c	29.3	n\a
surface, 10m	26.9c	29.6	surface
bottom, 10m	27.0c	29.5	n\a

Date: July 3, 1992
Location: Transect 1
Time:14:40

Reference	Temperature	Salinity	Depth
surface, 0m	26.0c	29.7	surface
bottom, 0m	26.0c	29.9	3.1m
surface, 10m	26.0c	30.4	surface
bottom, 10m	26.0c	30.0	2.7m

Date: July 9, 1992
Location: Transect 1
Time: 15:20

Reference	Temperature	Salinity	Depth
surface, 0m	23.9c	29.7	surface
bottom, 0m	24.0c	29.2	n\a
surface, 10m	24.0c	29.2	surface
bottom, 10m	24.0c	29.9	n\a

TABLE 11

Date: July 9, 1992
Location: Transect 2
Time: 15:30

Reference	Temperature	Salinity	Depth
surface, 0m	23.9c	29.4	surface
bottom, 0m	24.0c	29.3	n\a
surface, 10m	23.9c	29.6	surface
bottom, 10m	24.0c	29.7	n\a

Date: July 16, 1992
Location: Transect 1
Time: 15:00

Reference	Temperature	Salinity	Depth
surface, 0m	25.0c	29.5	surface
bottom, 0m	25.0c	30.0	3m
surface, 10m	25.0c	30.0	surface
bottom, 10m	25.0c	30.0	2.8m

Location: Transect 2
Time: 15:30

Reference	Temperature	Salinity	Depth
surface, 0m	25.0c	30.0	surface
bottom, 0m	25.0c	30.0	1.8m
surface, 10m	25.0c	30.0	surface
bottom, 10m	25.0c	30.0	1.2m

TABLE 11 cont'd

V. DISCUSSION

Comparisons were made between data from the 1991 and the 1992 surveys to determine any changes in the overall tidal pool health. Coral species recently observed by the 1992 survey team were compared to those observed last year. According to 1991 results, Porites lobata was the most abundant coral at an average of 22.0%. We found the same species to cover 23.35% of the area this year. Differences in the percentages may be due to the fact that last year's survey team used the point-intersect method to calculate coral cover percentages whereas we used the quadrat area method which is more accurate. Also, the 1991 team surveyed only every other meter mark along the lines, whereas we recorded all ten marks. One last difference is that they surveyed all three lines while we only had the manpower and time for two to be completed. We believe that the contrast in the percentages is due to the different methods of measurement.

The fish census data was consistent with last year's data in that Thalassoma duperrey was the most abundant species present at 19.2% in 1991 and 19.16% in 1992. Since the data taken last year was done along eight transects and this year's data was only completed on two lines, we felt that it was not fair to compare the remaining results.

Invertebrate data was not compared to last year's survey because data was not available. Our data proved Phylum Echinodermata to be the most abundant along transect two because of the heavy rock cover, 53.6%, home to the rock boring sea

urchins (E. mathaei, E. oblonga, H. mammillatus), which made up 58.4% of daytime invertebrates along this line. Sea cucumbers and members of Phylum Annelida were found in smaller numbers because they are mostly nocturnal animals and unfairly represented in the daytime surveys. If night surveys had been performed, numbers in these categories and also others would have been much higher.

Water samples were taken to provide temperature and salinity data comparative for future projects. Any significant changes could be evidence used to help explain any increase or decrease in animal/plant populations in future surveys.

Based on the data collected for the 1991 and 1992 surveys, we can make the conclusion that the health of the Kapoho tidal pools has remained relatively constant, with few changes.

VI. REFERENCES

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